Space Weather Technical Forecast

Issued on Sunday, 29 May 2022 at 13:26 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Slight chance of and isolated M-class flare. Slight chance of G1/Minor Storm interval.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Low with only two low level C-class flares observed. There are three simple sunspots on the visible disc, all of these weak alpha regions. No Earth directed CMEs have been observed in coronagraph imagery in the last 24 hours.

Solar Wind / Geomagnetic Activity: The solar wind, as observed by DSCOVR at L1, has averaged 500km/s over the last 24 hours, but with a recent increase to 550km/s, due to combination of high speed streams from coronal hole 84 and 85, with average density. Total magnetic field strength, Bt, has been largely weak, with the north-south component, Bz starting weakly northward, before becoming mainly southward from 29/0000UTC. Phi angle has been predominantly negative (towards the Sun). Geomagnetic activity was Quiet to Unsettled.

Energetic Particles / Solar Radiation: The high energy proton flux (10 MeV) has been at background levels through the last 24 hours. The high energy electron flux (greater than 2 MeV) was at background levels. Corresponding electron fluence has followed a rising trend following an earlier sharp decline and was at 1.88e6 integrated pfu observed at 29/0000UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Solar activity is expected to be mainly Low, but with a slight chance of M-class flares due AR3017 which has just rotated across the western limb.

Solar Wind / Geomagnetic Activity: There is a chance that a south directed CME that left the Sun on 28 May may glance the Earth on 01 June. Otherwise, Earth is currently experiencing the fast wind from a combination of coronal holes 84 and 85, with this expected to gradually ease by the end of the period. Geomagnetic activity is expected to be mainly Quiet to Unsettled on day 1 and part of day 2, with a slight chance of Active and a very slight chance of G1/Minor Storms. Mainly Quiet conditions are then likely with a very slight chance on day 4 (01 June) due to the possible CME arrival.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) is expected to be at Background levels during this period. High energy electron flux (greater than 2MeV) is expected to remain at background levels initially, with a rise expected as the high speed streams ease. Electron fluence is forecast to follow a rising trend, but not reach the Active (1e8 integrated pfu) threshold.

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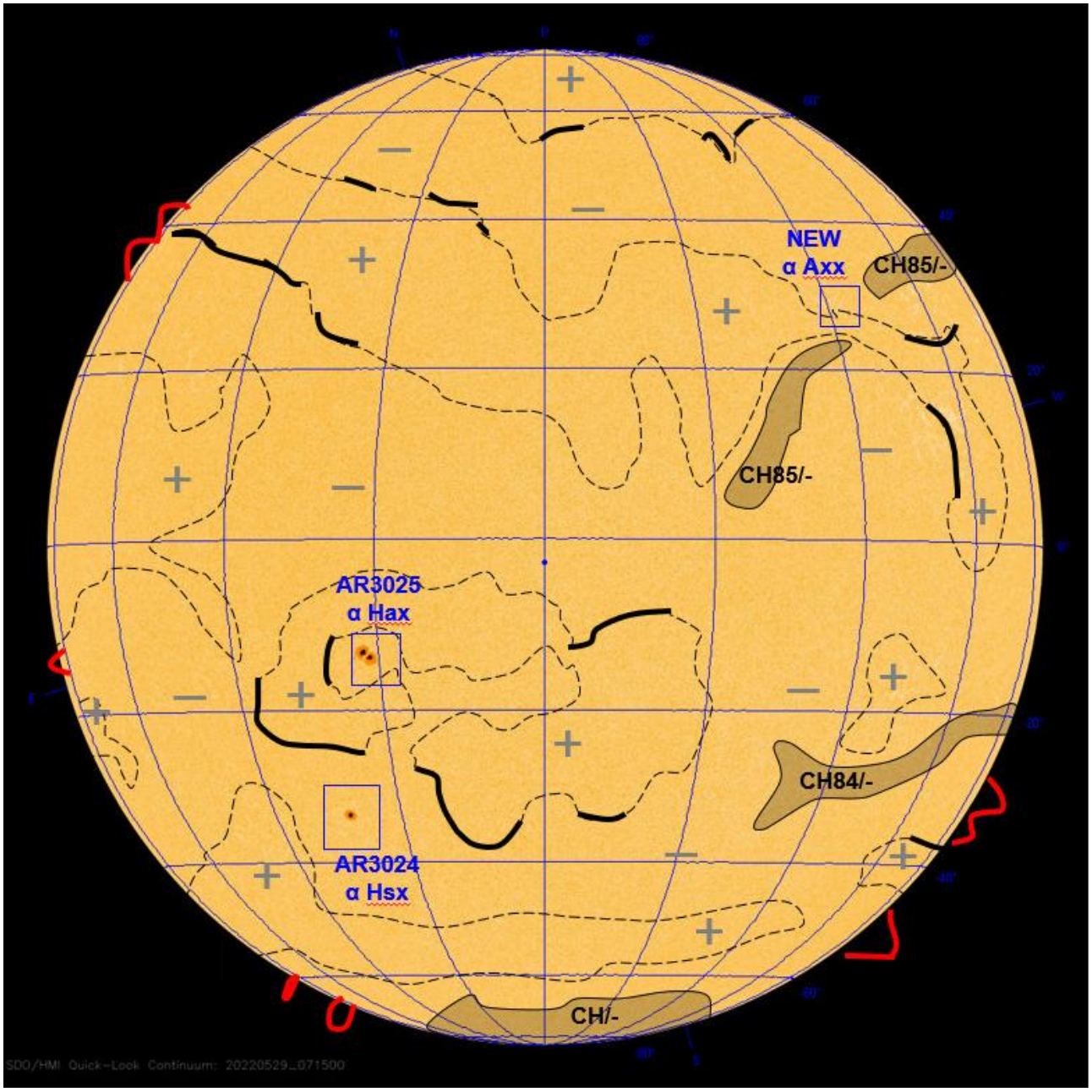
Figure 1. Solar Analysis Valid 29/0800UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

A further CME from 28 May is due to pass to the south of the Earth on 01 June, but could give a glancing blow.

Earth is currently in the high speed stream from either coronal hole 84 or 85 and perhaps a combination of both. The longitudinal extent of both holes suggests that the high speed stream could continue through to day 2 (30 May) or day 3 (31 May).

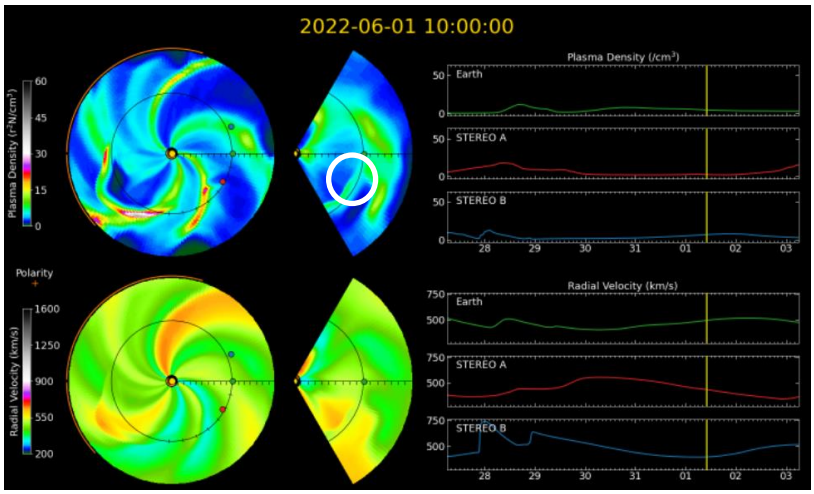
Geomagnetic activity is expected to be mainly Quiet to Unsettled on day 1 and part of day 2, with a slight chance of Active and a very slight chance of G1/Minor Storms. Mainly Quiet conditions are then likely with a very slight chance on day 4 (01 June) due to the possible CME arrival.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	10	5	1	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity – Earthbound Coronal Mass Ejections

None expected

Figure 2: MOSWOC Enlil, with possible glancing CME on 01 June circled.



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Met Office Space Weather Technical Forecast

Radio Blackouts - X-Ray Flares:

Solar activity is expected to be mainly Low over the next four days, with only three simple sunspots on the visible disc. The slightly elevated risk of M-class flaring is due to the risk from AR3017, a historically active sunspot, which could still produce observable flares from just beyond the limb.

There are a number of bright regions visible beyond the eastern limb on STEREO EUVI imagery, will rotate onto the visible disc through the next four days.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	5	5	5	5
Very Active	R3 to R5 X Class	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

The high energy proton flux (greater than 10 MeV) is at background levels and is most likely to remain so through the period.

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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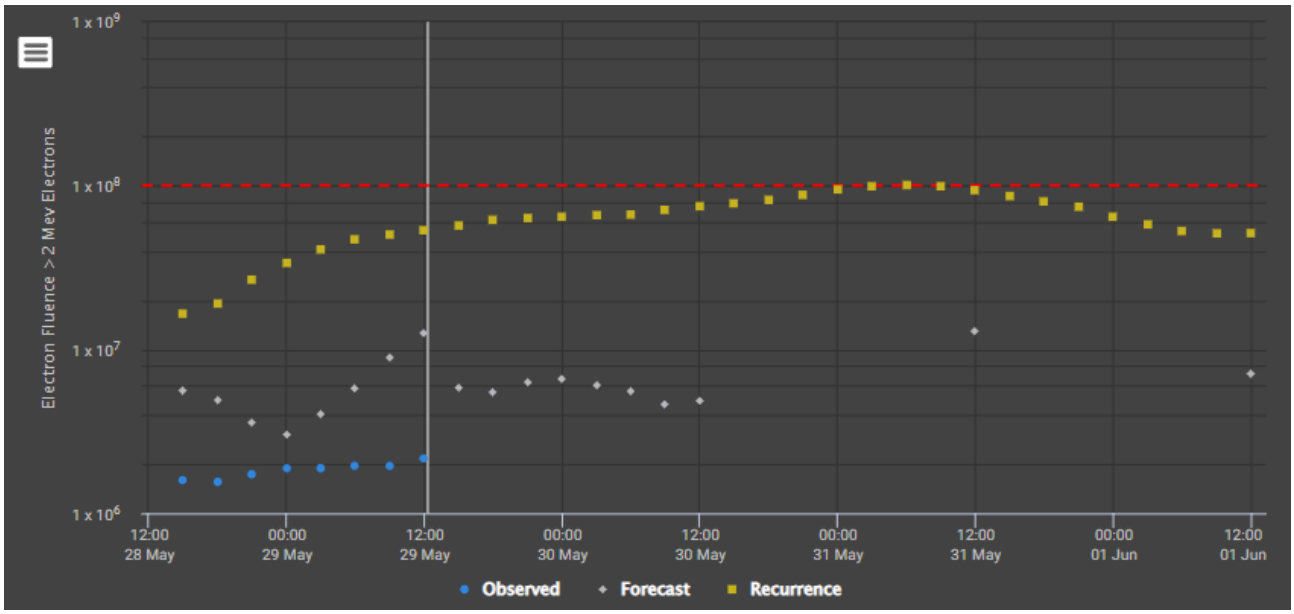
High Energy Electrons Event (≥ 2MeV):

The high energy electron flux (greater than 2MeV) is currently at normal background levels due to a combination of the recent geomagnetic storming and the compression of the radiation belts away from natural orbits. A gradual decompression of the radiation belts away from the orbits is expected later in the period which should result in a sharp rise in electron belts.

Electron fluence is expected to rise in line with electron fluence values. Current MOSWOC REFM models is suggesting a decline, likely due to an absence of elevated winds in the REFM model. Persistence is expected to be a better guide, but with a lower starting level and a small coronal hole on this occasion, the magnitude is expected to be lower. There is an expected trend towards the Active (1e8 integrated pfu) threshold later in the period, but with only a slight chance of reaching the threshold.

GEO Electron Environment	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ 2 MeV ≥ $1x10^8$	No	10	20	30	30
Very Active	≥ 2 MeV ≥ $1x10^9$	No	1	1	1	1

Figure 3: MOSWOC REFM model



NOTE: Our REFM model has been upgraded and has changed in appearance. The two main changes are the option to include a recurrence graph, which traces what happened on during last solar rotation for comparison and potential expectation in the coming 3 days (each plot is the observation from T-minus 28 days). Also, the cadence of REFM forecast fluence data is reduced past day 1 to only one value per day. The cadence remains 3-hourly for the first 24 hours.

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